

University of Windsor
Department of Electrical and Computer Engineering
ELEC 8590 Physical Design Automation for VLSI & FPGAs
Winter 2020

Placement Exercise (Due Tuesday, February 23, 2021, in class)

This homework exercise involves working with the VPR FPGA placement and routing tool. The goal is to try different VPR placement options in order to gain more insight into the simulated annealing algorithm used for placement in VPR. In all cases use the ***-placeonly*** option so that VPR does not do routing. Use the following three benchmark circuits in this homework exercise: ***apex2***, ***frisc*** and ***s38417***. Give an analysis of the results, i.e. briefly explain why results are similar or different when using different options and values for the same benchmark circuit. To get an idea about the effect of different values used of an option on placement results, see VPR manual.

- (a) Run vpr using ***-seed*** option with seed values 1, 7 and 15. Tabulate the results for each benchmark circuit. Show initial BB cost, final BB cost and percentage reduction in BB cost. Also show the approximate run time. Use default values for all other options, e.g.

vpr apex2.net 4lut_sanitized.arch apex2.p.seed5 -place_only -seed 5 > run_seed5 &

- (b) Run vpr using ***-inner_num*** option with inner_num values 1, 10 and 20. Tabulate the results for each benchmark circuit. Show initial BB cost, final BB cost and percentage reduction in BB cost. Also show the approximate run time. Use default values for all other options, e.g.

vpr apex2.net 4lut_sanitized.arch apex2.p.innernum1 -place_only -inner_num 1 > run_innernum1 &

- (c) Run vpr using all default values with and without the ***-fast*** option. Tabulate and compare the results for each benchmark circuit, with and without ***-fast*** option. Show initial BB cost, final BB cost and percentage reduction in BB cost. Also show the approximate run time. For ***-fast*** option, use default values for all other options, e.g.

vpr apex2.net 4lut_sanitized.arch apex2.p.fast -fast -place_only > run_fast &

General notes

- See “VPR Setup Guide” for detailed instructions on how to download and use VPR.
- Make separate subdirectory for each benchmark circuit. That way the data you generate will be easy to manage and analyze.
- Use unix shell scripts if you want to run your jobs in batch mode. In this case you may have to use -nodisp option to disable graphics. If you are using graphics, exit after placement is done.
- Some of the issues are left for you to investigate and figure out, use your best judgement.